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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/863,737	05/23/2001	Noriaki Oda	12562A	1794

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EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 01/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/863,737

Applicant(s)

ODA ET AL.

Examiner

Monica Lewis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 May 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 09/275,532.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

### **DETAILED ACTION**

1. This office action is in response to the application filed May 23, 2001.

#### ***Priority***

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 09/275,532, filed on March 24, 1999.

#### ***Drawings***

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: a) 19 (Figure 5) and 10 (Figure 7). A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

#### ***Specification***

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

#### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. Claims 1, 2, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art Figures 1-3 in view of Kodera et al. (U.S. Patent No. 5,893,752).

In regards to claims 1 and 5, Applicant's Admitted Prior Art discloses the following:

a) a semiconductor device having a plurality of wirings (8, 15, 20) juxtaposed with one another (See Figure 1); and

b) a SiOF insulating film (4,12,17) being in contact with the wirings (See Figure 1).

In regards to claims 1 and 5, Applicant's Admitted Prior Art fails to disclose the following:

a) the fluorine concentration of the SiOF insulating film at a wiring gap portion is set to be higher than the fluorine concentration of the SiOF insulating film on the wirings.

However, Kodera et al. ("Kodera") discloses a semiconductor device where the fluorine concentration of the SiOF (26) at the wiring gap is higher than the concentration of the insulating film (27) on the wirings (See Column 3 Lines 32-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Admitted Prior Art to include a higher fluorine concentration of SiOF at the wiring gap than the concentration of the insulating film on the wirings as disclosed in Kodera because it reduces the capacitance among the wiring therefore resulting in a high operating speed.

In regards to claims 2 and 6, Applicant's Admitted Prior Art discloses the following:

a) the SiOF insulating film (4, 12) at a wiring gap portion comprises a first SiOF film (11) and a second SiOF film (9) formed on the first SiOF film, the SiOF insulating film on the wirings comprises the second SiOF film (See Figures 2 and 3).

In regards to claims 2 and 6, Applicant's Admitted Prior Art fails to disclose the following:

a) the fluorine concentration of the first SiOF film is higher than the fluorine concentration of the second SiOF film.

However, Kodera discloses a semiconductor device where the fluorine concentration of the first SiOF film is higher than the concentration of second SiOF film (See Column 3 Lines 32-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Admitted Prior Art to include a fluorine concentration of the first SiOF film that is higher than the concentration of second SiOF film as disclosed in Kodera because it reduces the capacitance among the wiring therefore resulting in a high operating speed.

7. Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art Figures 1-3 in view of Kodera et al. (U.S. Patent No. 5,893,752) as applied to claims 1, 2, 5 and 6 above, and further in view of Homma (U.S. Patent No. 5,399,529).

In regards to claims 3 and 7, Applicant's Admitted Prior Art discloses the following:

a) thickness of the first SiOF film at a center of the wiring gap portion is within the range of  $1/3$  to  $1/1$  times of the thickness of the wirings.

However, Homma discloses a semiconductor device where the thickness of the SiOF film is  $1/3$  to  $1/1$  times the thickness of the wirings (See Column 2 Lines 43-54). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Admitted Prior Art to include a SiOF film that has a

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thickness that is 1/3 to 1/1 of that of the wirings as disclosed in Homma since such ratios reduce the capacitance among the wiring therefore resulting in a high operating speed.

8. Claims 4 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art Figures 1-3 in view of Kodera et al. (U.S. Patent No. 5,893,752) as applied to claims 1, 2, 5 and 6 above, and further in view of Nishiyama et al. (U.S. Patent No. 5,429,995).

In regards to claims 4 and 8, Applicant's Admitted Prior Art fails to disclose the following:

a) fluorine concentration of the first SiOF film is set to 5 atom % or more, and the fluorine concentration of the second SiOF film is set to be less than 5 atom %.

However, Nishiyama et al. ("Nishiyama") discloses a semiconductor device where the fluorine concentration of SiOF is greater and lesser than 5 at % (See Column 4 Lines 30-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Admitted Prior Art to include SiOF where the fluorine concentration is greater and lesser than 5 at % as disclosed in Nishiyama because it manipulates the power consumption and operating speed of the system.

### ***Conclusion***


9. Applicant is advised that should claim 1 be found allowable, claim 5 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

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10. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) Homma (U.S. Patent No. 5,334,552) discloses a method for fabricating a semiconductor device that has a multi-layer interconnection structure; b) Matsuura (U.S. Patent No. 5,703,404) discloses a semiconductor device comprising a SiOF film; c) Kaji (U.S. Patent No. 5,571,578) discloses forming silicon oxide on a semiconductor; and d) Ueno et al (U.S. Patent No. 5,521,424) discloses a semiconductor device having a silicon oxide film containing fluorine atoms.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML  
January 11, 2002

  
**CARL WHITEHEAD, JR.**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**